

IN THE CLAIMS:

No claims have been amended herein. All of the pending claims 1 through 20 are presented below. This listing of claims will replace all prior versions and listings of claims in the application. Please enter these claims as previously amended.

Listing of Claims:

1. (Previously presented) A process for fabricating a contact structure in a silicon region in an integrated semiconductor circuit on a surface of a semiconductor wafer comprising:
depositing a dielectric layer over at least a portion of the silicon region;
etching a contact opening through the dielectric layer, the contact opening having a sidewall and terminating in a bottom exposing a portion of the silicon region;
depositing a titanium metal layer within the contact opening covering the portion of the silicon region exposed by the bottom of the contact opening;
depositing an amorphous titanium carbonitride film having substantially no crystalline titanium nitride therein on the sidewall of the contact opening and over the titanium metal layer using a carrier gas having a precursor compound; and
filling at least a portion of the contact opening using a conductive material to form a contact structure.
2. (Original) The process of claim 1, wherein depositing the amorphous titanium carbonitride film having substantially no crystalline titanium nitride therein comprises a chemical vapor deposition process.
3. (Previously presented) The process of claim 2, further comprising:
evacuating a deposition chamber to a pressure of less than about 100 torr;
heating the semiconductor wafer to a temperature in a range of about 200°C to about ~~600°C~~; 600°C; and

depositing the amorphous titanium carbonitride film having substantially no crystalline titanium nitride therein using an organometallic precursor compound comprising tetrakis-dialkylamido-titanium in the deposition chamber by thermal decomposition thereof at or near the surface of the semiconductor wafer.

4. (Original) The process of claim 3, wherein the organometallic precursor compound comprises tetrakis-dimethylamido-titanium.

5. (Original) The process of claim 1, wherein the conductive material comprises a metal selected from the group consisting of tungsten, aluminum, copper and nickel.

6. (Original) The process of claim 1, wherein the conductive material comprises doped polycrystalline silicon.

7. (Original) The process of claim 1, further comprising:
forming a titanium silicide layer by heating the semiconductor wafer and reacting at least a portion of the titanium metal layer with the silicon region.

8. (Previously presented) The process of claim 7, wherein the titanium silicide layer is formed prior to depositing the amorphous titanium carbonitride film having substantially no crystalline titanium nitride therein.

9. (Previously presented) The process of claim 7, wherein the titanium silicide layer is formed subsequent to depositing the amorphous titanium carbonitride film having substantially no crystalline titanium nitride therein.

10. (Original) The process of claim 3, further comprising:
thermally processing the amorphous titanium carbonitride film in an atmosphere in the
deposition chamber including one or more gases selected from the group consisting of
nitrogen, hydrogen and the noble gases.

11. (Previously presented) An integrated semiconductor circuit fabrication process
for a contact structure in a silicon region in an integrated semiconductor circuit on a surface of a
semiconductor wafer comprising:
depositing a dielectric layer over at least a portion of the silicon region;
etching a contact opening through the dielectric layer, the contact opening having a sidewall and
terminating in a bottom exposing a portion of the silicon region;
depositing a titanium metal layer within the contact opening covering the portion of the silicon
region exposed by the bottom of the contact opening;
depositing an amorphous titanium carbonitride film having substantially no crystalline titanium
nitride therein on the sidewall of the contact opening and over the titanium metal layer
using a carrier gas having a precursor compound; and
filling at least a portion of the contact opening using a conductive material.

12. (Original) The process of claim 11, wherein depositing the amorphous titanium
carbonitride film having substantially no crystalline titanium nitride therein comprises a chemical
vapor deposition process.

13. (Previously presented) The process of claim 12, further comprising:
evacuating a deposition chamber to a pressure of less than about 100 torr;
heating the semiconductor wafer to a temperature in a range of about 200°C to about 600°C;
600°C; and

depositing the amorphous titanium carbonitride film having substantially no crystalline titanium nitride therein using an organometallic precursor compound comprising tetrakis-dialkylamido-titanium in the deposition chamber by thermal decomposition thereof at or near the surface of the semiconductor wafer.

14. (Original) The process of claim 13, wherein the organometallic precursor compound comprises tetrakis-dimethylamido-titanium.

15. (Original) The process of claim 11, wherein the conductive material comprises a metal selected from the group consisting of tungsten, aluminum, copper and nickel.

16. (Original) The process of claim 11, wherein the conductive material comprises doped polycrystalline silicon.

17. (Original) The process of claim 11, further comprising:
forming a titanium silicide layer by heating the semiconductor wafer and reacting at least a portion of the titanium metal layer with the silicon region.

18. (Previously presented) The process of claim 17, wherein the titanium silicide layer is formed prior to depositing the amorphous titanium carbonitride film having substantially no crystalline titanium nitride therein.

19. (Previously presented) The process of claim 17, wherein the titanium silicide layer is formed subsequent to depositing the amorphous titanium carbonitride film having substantially no crystalline titanium nitride therein.

20. (Original) The process of claim 13, further comprising:
thermally processing the amorphous titanium carbonitride film in an atmosphere in the
deposition chamber including one or more gases selected from the group consisting of
nitrogen, hydrogen and the noble gases.